UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/755,389	01/05/2001	Sanjeev Banerjia	10990960-1	5215

22879	7590	11/17/2004	**EXAMINER**

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EXAMINER
FOWLKES, ANDRE R

ART UNIT	PAPER NUMBER
2122	

DATE MAILED: 11/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	Applicant(s)
Office Action Summary	09/755,389	BANERJIA ET AL.
	Examiner	Art Unit	
	Andre R. Fowlkes	2122	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 August 2004*.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All   b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other: _____.

DETAILED ACTION

1. This action is in response to the amendment filed on 03/18/2004.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act

of 1999 (AIPA) and the Intellectual Property and High Technology Technical

Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting

directly or indirectly from an international application filed before November 29, 2000.

Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior

to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 1-10, 12-20, 22 and 23 rejected under 35 U.S.C. 102(e) as being

anticipated by Chilimbi et al. (Chilimbi), U.S. Patent No. 6,330,556.

As per claim 1, Chilimbi discloses a system to optimize cache utilization using

hot/cold fields to partition data by a compiler (Fig. 9 step 825 and at col. 12:20-50),

which covers the steps of:

    - storing a plurality of data **in a cold partition in a memory** (col. 2 lines 39-43,

"the most heavily referenced (data) ... are kept in a hot (memory location) ... while the

remaining (data) ... are placed in a ... cold (memory location)"),

    - determining whether the datum **that has been stored in the cold partition**

is hot (col. 2 lines 39-43, "the most heavily referenced (data) ... are kept in a hot

(memory location) ... while the remaining (data) ... are placed in a ... cold (memory

location)"),

    - moving the data **to a hot partition in the memory when** the datum **has been**

determined to be hot (col. 2 lines 37-43, "The partitioning is based on profile

information about (data) ... access counts ... the most heavily referenced (data are

placed) ... in a hot (memory location) ... while the remaining (data) ... are placed in a ...

cold (memory location)").

    As per claim 2, the rejection of claim 1 is incorporated and further, Chilimbi

discloses that **the step of determining whether the** datum **is hot comprises:**

maintaining a different associated counter for each of a plurality of datum **in the**

cold partition of the memory; incrementing or decrementing the count in the

associated counter each time its associated data is executed; and concluding the

determination that a data is hot if the count in the associated counter reaches a

first threshold value (col. 2 lines 37-43, "The partitioning is based on profile

information about (data) ... access counts ... the most heavily (executed data) ... are

kept in a hot (memory location) ... while the remaining (data) ... are placed in a ... cold

(memory location)").

As per claim 3, the rejection of claim 1 is incorporated and further, Chilimbi

discloses that the **hot partition is contiguous and disjoint from said cold partition**

in said memory (col. 3 lines 65-67, "division of (data) into two (groups) comprising hot

access fields and cold access fields", and Fig. 1, item 22, and the associated text (e.g.

col. 4 line 5 – col. 5 line 67), describes the computer memory used in this system, which

is capable of containing contiguous and disjoint memory sections).

As per claim 4, the rejection of claim 2, is incorporated and further, Chilimbi

discloses **maintaining an associated counter step comprises maintaining counters**

in a data structure external to cache memory (col. 2 lines 37-39, "The partitioning is

based on profile information about (data) ... access counts", and Fig. 1, item 20, and the

associated text (e.g. col. 4 line 5 – col. 5 line 67), describes a conventional computer

system, which is capable of maintaining counters external to cache memory).

As per claim 5, the rejection of claim 4 is incorporated and further, Chilimbi

discloses **the step of at least temporarily delinking blocks of translations stored in**

said cold partition so that control exits the cache memory in order to perform the

incrementing or decrementing step (col. 2 lines 35-36, "Data structures (blocks) are

partitioned (delinked and accounted for) into heavily referenced and less heavily

references partitions").

As per claim 6, the rejection of claim 2 is incorporated and further, Chilimbi

discloses that **maintaining within said memory an associated counter step**

comprises maintaining one of said associated counters for each entry point into a

plurality of the data **in said cold partition of the memory** (col. 2 lines 37-39, "The

partitioning is based on profile information (maintained in the memory) about (data) ...

access counts").

As per claim 7, the rejection of claim 2 is incorporated and further, Chilimbi

discloses **maintaining an associated counter step comprises logically embedding**

update code on an arc between two data items (col. 6 lines 58-63, "Each of the data

elements defined in FIG. 2 are shown as nodes (i.e. individual data items) in FIG. 3 with

arcs or edges drawn between them. The nodes are representative of all instances of the

data structure. The edges are weighted to indicate field affinity (i.e. an associated

counter)").

As per claim 8, the rejection of claim 2 is incorporated and further, Chilimbi

discloses **maintaining an associated counter step comprises maintaining one of**

said associated counters for each item in the hot and cold memory locations **in an**

associated microprocessor (col. 2 lines 37-43, "The partitioning is based on profile

information about (data) ... access counts ... the most heavily referenced (data) ... are

kept in a hot (memory location) ... while the remaining (data) ... are placed in a ... cold

(memory location)").

As per claim 9, the rejection of claim 2 is incorporated and further, Chilimbi

discloses that the data **moving step comprises sampling a plurality of said**

associated counters on an intermittent basis to determine if the count therein has

reached said threshold value (col. 2 lines 37-43, "The partitioning is based on profile

information about (data) ... access counts (which is sampled on an intermittent basis,

then) ... the most heavily (executed data) ... are (placed) in a hot (memory location) ...

while the remaining (data) ... are placed in a ... cold (memory location)").

As per claim 10, the rejection of claim 1 is incorporated and further, Chilimbi

discloses **determining if a number of hot data in said hot partition of said memory**

exceeds a second threshold value; and if said number of said hot data exceeds

said second threshold value, then expanding the size of said hot partition in said

memory by adding thereto an expansion area contiguous to said hot partition

(col. 2 lines 37-39, "The partitioning is based on profile information about (data) ...

access counts", and Fig. 1, item 20, and the associated text (e.g. col. 4 line 5 – col. 5

line 67), describes a conventional computer system, which is capable of creating and

maintaining numerous memory partitions).

As per claim 12, Chilimbi also discloses such claimed limitations as addressed in claim 2, above.

As per claims 13-20 and 22 this is a system version of the claimed method discussed above, in claims 1-6, 9 10 and 12, wherein all claimed limitations have also been addressed and/or cited as set forth above. For example, see Chilimbi's system to optimize cache utilization, (col. 2:35-56).

As per claim 23, this is a product version of the claimed method discussed above, in claim 1, wherein all claimed limitations have also been addressed and/or cited as set forth above. For example, see Chilimbi's system to optimize cache utilization, (col. 2:35-56).

4.   Claims 11 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chilimbi et al. (Chilimbi), U.S. Patent No. 6,330,556 in view of Walls, U.S. Patent No. 5,675,790.

As per claim 11, the rejection of claim 10 is incorporated and further Chilimbi does not explicitly disclose **removing all cold translations from said expansion area and storing said removed translations in said cold partition.**

However, Walls, in an analogous environment, discloses **removing all** less-desirable data entries from a dynamic memory **area and storing said removed** data in

a separate location (col. 8 lines 36-39, "If the segment (data) is smaller than the minimum size (less-desirable) then remove the segment from the (section of) dynamic memory ... (and) insert the segment into a separate (location)").

Therefore, it would have been obvious to a person of ordinary skill in the art, at the time the invention was made, to incorporate the teachings of Walls into the system of Chilimbi to enable **removing all cold translations from said expansion area and storing said removed translations in said cold partition.** The modification would have been obvious because one of ordinary skill in the art would want to maintain the temporal access advantages by keeping the less-desirable data items together and separate from both the most and least desirable data items.

As per claim 21, the combination of Chilimbi and Walls also discloses such claimed limitations as addressed in claim 11, above.

Response to Arguments

5.   Applicants arguments have been considered but they are not persuasive.

In the remarks, the applicant has argued substantially that:

1)   None of the applied references relate to a code cache and therefore do not teach any of the claimed features related to the storage and movement of instruction translations between hot and cold partitions of a code cache, at p. 7:19-21.

Examiner's response:

1)   The instant application and the applied reference combination are both in the

same field of endeavor and are solving the same problem. The instant application uses

a "cache organization that increase performance through selective placement of

translations (i.e. data) within the ... cache" (Spec, p. 1, lines 8-9), while the Chilimbi

reference is directed to optimizing cache utilization by selective placement of data, as

well (Chilimbi col. 1:32-33), and particularly, the compiler is used to partition data into

hot/cold fields (Chilimbi col. 12:20-50). Using a cache to store instruction translations

as opposed to another type of data does not distinguish the instant application over the

applied art.

In the remarks, the applicant has argued substantially that:

2)   The specification of the instant application discusses the different considerations

that distinguish code caches from data caches, at p. 8:7-8.

Examiner's response:

2)   In response to applicant's argument that the references fail to show certain

features of applicant's invention, it is noted that the features upon which applicant relies

(i.e., the different considerations that distinguish code caches from data caches) are not

recited in the rejected claim(s). Although the claims are interpreted in light of the

specification, limitations from the specification are not read into the claims. See *In re*

Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In the remarks, the applicant has argued substantially that:

3)   Chilimbi discusses splitting data structures while instructions or blocks of

instructions cannot be split in this manner, at p. 8:11-13.

Examiner's response:

3)   A cache stores a subset of a larger set of data/instructions. The data/instructions

must be separated in some way in order to utilize a caching scheme.

Conclusion

6.   **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time

policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Andre R. Fowlkes whose telephone number is (571)
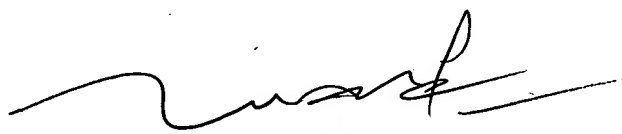
272-3697. The examiner can normally be reached on Monday - Friday, 8:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam can be reached on (571)272-3695. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ARF

TUAN DAM
SUPERVISORY PATENT EXAMINER